

WHAT IS CLAIMED IS:

1. Illumination system for wavelengths  $\leq 193$  nm, particularly for EUV lithography with  
a device for producing secondary light sources;  
comprising at least a mirror, which is divided into raster elements;  
one or more first optical elements, which are arranged between the device and an image plane of the illumination system;  
wherein the first optical elements image the secondary light sources in an exit pupil of the illumination system;  
wherein the raster elements are tilted to have a converging effect to an  
diverging light  
beam which is impinging onto the first mirror.
2. The illumination system according to claim 1, wherein the raster elements  
of the first  
mirror produce the secondary light sources.
3. The illumination system according to claim 1, wherein the raster elements  
have positive optical power.
4. The illumination system according to claim 1, wherein the raster elements  
are arranged such that images of the raster elements are superimposed,  
at least partially, in the image plane.
5. The illumination system according to claim 1, wherein the raster elements  
have rectangular shape.
6. The illumination system according to claim 1, wherein said one or more  
first optical elements comprise an optical element for forming a ring field.

7. The illumination system according to claim 1, wherein each of the raster elements has a center (ray and wherein the raster elements are arranged on a surface of the first mirror such that at least two of the central rays intersect each other in the image plane.
8. The illumination system according to claim 1, further comprising a second mirror or lens with raster elements, wherein said first mirror or lens comprises a plurality of field raster elements, and wherein the second mirror or lens comprises a plurality of pupil raster elements.
9. The illumination system of claim 8, wherein the pupil raster elements are located at or nearby a site of the secondary light sources.
10. The illumination system of claim 8, wherein each of the field raster elements correspond to one of the pupil raster elements, and wherein each of the pupil raster elements images its corresponding field raster element in the image plane.
11. The illumination system according to claim 10, wherein the field raster elements and the pupil raster elements are arranged to provide a light path between a pair of the field raster elements and the pupil raster elements.
12. The illumination system according to claim 1, comprising a collector unit having one or more second optical elements, said second optical elements for producing said divergent light beam.
13. The illumination system according to claim 1, wherein the wavelengths are in a range of about 10 nm to 15 nm.
14. A projection exposure apparatus for microlithography comprising:  
an illumination system according to claim 1

a mask on a first carrier system, the mask being positioned in the image plane of the illumination system;  
 a projection objective with an entrance pupil, the entrance pupil being in a same plane as the exit pupil of the illumination system; and  
 a light sensitive object on a carrier system,  
 wherein the mask is imaged by the projection objective onto the light sensitive object.

15. A process for producing microelectronic components, particularly semiconductor microdevices, comprising the step of utilizing a projection exposure apparatus according to claim 14.

16. Illumination system for wavelengths  $\leq 193$  nm, particularly for EUV lithography with  
 a device for producing secondary light sources;  
 comprising at least a mirror, which is divided into raster elements;  
 one or more first optical elements, which are arranged between the device and a image plane of the illumination system;  
 wherein the first optical elements image the secondary light sources in a exit pupil of the illumination system;  
 wherein the raster elements are tilted to have a converging effect to an  
     diverging light  
 beam which is impinging onto the first mirror  
 wherein the raster elements of the first mirror have a rectangular shape and  
     produce the  
 secondary light sources and the raster elements have positive optical power and are arranged such that images of the raster elements are superimposed, at least partially, in the image plane  
 wherein the one or more first optical elements comprise a element for forming a ring field.

204000.02406001

17. The illumination system according to claim 16, further comprising a second mirror or lens with raster elements, wherein said first mirror comprises a plurality of field raster elements, and wherein the second mirror or lens comprises a plurality of pupil raster elements.

18. The illumination system of claim 17, wherein the pupil raster elements are located at or nearby a site of the secondary light sources.

19. The illumination system of claim 17, wherein each of the field raster elements correspond to one of the pupil raster elements, and wherein each of the pupil raster elements images its corresponding field raster element in the image plane.

20. The illumination system according to claim 19, wherein the field raster elements and the pupil raster elements are arranged to provide a light path between a pair of the field raster elements and the pupil raster elements.

21. Illumination system for wavelengths  $\leq 193$  nm, particularly for EUV lithography with  
a primary light source;  
a device for producing secondary light sources  
comprising at least a first mirror, which is divided into raster elements; and  
one or more first optical elements, which are arranged between the device and an image plane of the illumination system,  
wherein the first optical elements image the secondary light sources in an exit pupil of the illumination system;  
wherein the device for producing secondary light sources comprises a  
collector unit,  
wherein a diverging beam is impinging on the collector unit,  
wherein the collector unit comprises one or more second optical elements for  
collecting  
the diverging beam,

wherein the second optical element comprises the first mirror or lens which is divided into raster elements and wherein the raster elements are arranged to collect the diverging beam.

22. Illumination system according to claim 21, wherein the raster elements have rectangular shape.

23. Illumination system according to claim 21, wherein the first optical elements comprise an optical element for forming a ring field in said image plane.

24. Illumination system for wavelengths  $\leq 193$  nm, particularly for EUV lithography with a device for producing secondary light sources comprising at least a first mirror, which is divided into raster elements; with one or more first optical elements, which are arranged between the device and an image plane of the illumination system; wherein said raster elements produce said secondary light sources, wherein a diverging ray bundle is impinging onto the first mirror, wherein each of said raster elements has a center ray, and wherein said raster elements are arranged on a surface of said first mirror such that at least two of said center rays intersect each other in said image plane and that images of said raster elements are superimposed, at least partially, in said image plane; wherein the first optical elements image the secondary light sources in an exit pupil of the illumination system.

25. Illumination system according to claim 24, wherein the raster elements have rectangular shape.

26. Illumination system according to claim 24, wherein

637.0005USXQ

the first optical elements comprise an optical element for forming a ring field  
in said image plane.

27. Illumination system according to claim 24, wherein  
the first optical elements comprise a wobbling mirror.

28. Illumination system according to claim 27, wherein  
said wobbling mirror is arranged close to said image plane.

29. Illumination system according to claim 24, wherein  
the first optical elements comprise a mirror with a dynamically deformable  
mirror surface.

2010070 030402